Proximal Femoral Nail - A Minimally Invasive Method for Stabilization of Pertrochanteric and Subtrochanteric Femoral Fractures

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ABSTRACT

Fractures of the proximal femur are a big challenge in traumatology. Rapid strides in implant and instrumentations in quest of ideal fixation of pertrochanteric and subtrochanteric femoral fractures have made various options available like Fixed-angled nail plate, Screw plates, Angled blade plate, Dynamic Hip Screw etc. The present study aims to study the role of standard PFN as a minimal invasive device in the management of these fractures. A total of 30 cases of closed fractures (18 pertrochanteric and 12 subtrochanteric) of age 18 or above of either sex were evaluated from 2008 to 2009. 72.2% of pertrochanteric and 50% of subtrochanteric fractures were of unstable type. Full weight bearing in 73.4% of the cases was possible at 8 weeks postoperatively. The fracture union in 90% of cases was seen in 12 weeks. 96.7% of cases achieved pre-injury walking ability at the end of 24 weeks of follow up. The complications encountered were delayed union (2 cases), varus reduction (3 cases), difficult placement of neck screw/hip pin (2 cases) and intra articular migration of neck screw was encountered in 1 case. The current study shows that PFN is an evolving approach to treat intertrochanteric and high subtrochanteric femoral fractures in a minimally invasive way and indicates PFN to be a safe and successful method. Varus collapse, difficulty in placement of neck/hip pin screws and intra articular migration of neck /hip pin screw might be the complications in very few cases which can be minimized by minimizing the technical errors while screw insertion.

Keywords: Proximal Femoral nail, Intertrochanteric femoral fracture, Subtrochanteric femoral fracture

INTRODUCTION

Fractures of the proximal femur and hip are commonly encountered injuries in elderly. Regardless of the type of fractures, the proximal femoral fractures can lead to substantial morbidity and mortality1. The spectrum is however extending to involve the younger age because of high energy physical trauma and rapid industrialization with resultant complex pattern of injury in the working class of people2. Intertrochanteric fractures are extracapsular hip fractures and more than 50% are unstable. Unstable pattern occurs more commonly with increased age and with low bone mineral density3. Subtrochanteric fractures occur between the lesser trochanter and the isthmus of the diaphysis of the femur4. The common problem for these fractures has been malunion (in the form of shortening, angular deformity and rotational mal-alignment), delayed union or non-union5.

Internal fixation is the treatment of choice for treating pertrochanteric and subtrochanteric femoral fractures of the femur with the following aims:

1. To obtain best possible anatomic reduction.
2. To get stability for early mobilization and early weight bearing.
3. To reduce the complication associated with prolonged recumbency.
4. For maximal functional restoration.

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The Arbeitsgemeinschaft fur osteosynthesefragen (AO/ASIF) in 1996 designed a new intramedullary device - the Proximal Femoral Nail (PFN) to overcome the technical difficulties and complications encountered with the earlier designs of the intramedullary proximal femoral nails, most importantly, the Gamma Nail. The two main design differences between the PFN and other such devices are the introduction of an anti-rotational 6.5 mm of hip pin to reduce the incidence of the implant cut out, secondly the fluting of the nail tip, i.e., the tip has a smaller diameter and is specially shaped to reduce the stress at tip.

MATERIAL AND METHODS

A total of 30 patients of age 18 or above of either sex were evaluated. Only fresh cases with closed fractures (18 pertrochanteric and 12 subtrochanteric) were included in the study. Compound fractures, pathological fractures and polytrauma were excluded from the study.

All patients at admission were subjected to initial management and resuscitation followed by a detailed history, clinical examination and relevant investigations. Preoperative assessment of neck shaft angle, medullary canal size and any proximal femoral deformity was made.

The patients were positioned supine on the fracture table maintaining the 'heel to toe' relationship with C-Arm positioned in such a way so as to visualize the proximal femur in lateral and A-P planes. To overcome the difficulty in access to the tip of trochanter and for unimpeded access to the medullary cavity of the proximal femur, the trunk was abducted at waist by 10° to 15° to the contralateral side or the affected limb was adducted to 10° to 15°. All patients were treated by proximal femoral nail under C-Arm.

All patients were followed up, initially at 3 weekly intervals, till 12th postoperative week and then at 6 weekly interval till the completion of 24 weeks postoperatively. Further follow up was advised at 6 weekly intervals for the patients who showed complications associated with PFN and / or its technique. Weight bearing was gradually increased as per the radiological evaluation of the fractured site and the results were evaluated using Salvati and Wilson hip function scoring system and Kyle's criteria.

OBSERVATIONS AND RESULTS

Significant male predominance (63.3%) was observed as compared to females (36.7%). Road traffic accidents were the commonest mode of injury seen in 50% of the cases. However fall from height also accounted for some of these fractures. High energy trauma (RTA and fall from height) thus accounted for majority of the cases (63.3%).

Two peaks were observed in relation to the age sustaining these fractures. The first peak was in age group of 61 to 80 years (50%) followed by a second peak in age group of 21 to 40 (33.3%). The mean age was 58.4 years. The youngest patient was 23 years of age while the oldest was of 84 years of age.

The most common type of pertrochanteric femoral fracture was 31A2 (61.1%) while the most common type of subtrochanteric femoral fracture was Seinsheimer type III (41.7%). In majority of the cases (93.3%) the surgery was undertaken within 10 days of injury. The average duration of surgery from skin incision to skin closure was 80 minutes. The average stay in the hospital was 12 days. Three cases stayed for 18 days. Full weight bearing in 73.4% of the cases was at 8 weeks postoperatively. The fracture union in 90% of cases was seen in 12 weeks. 96.7% of cases achieved pre-injury walking ability at the end of 24 weeks of follow up. The mean Salvati & Wilson hip score at discharge was 15.16 and at 24 weeks postoperative it was 36.19 out of 40. As per Kyle's criteria 86.6% of cases had good to excellent results at 24 weeks of follow up.

The technique related complications were the commonest complications - varus reduction (3 cases), difficult placement of neck screw/hip pin (2 cases), difficult distal locking (4 cases) and intra articular migration of neck screw was encountered in 1 case. Other complications were delayed union (2 cases), knee stiffness (6 cases) delayed wound healing and shortening in 2 cases.

Fig 1: Postoperative Xray 8 weeks & 12 weeks
DISCUSSION

Majority of cases were elderly in 61 to 80 years (50%) of age group followed by young in the age group of 21 to 40 years (33.3%). The second peak of young patients can be explained by their active outdoor life exposing them to road traffic accidents. The male to female ratio was 3:2 highlighting the more aggressive lifestyle in males. High energy trauma constituted (RTA & fall from height) 63.3% while the low energy trauma constituted 36.7% of cases. This is explained by higher vehicular accidents and poor road conditions in our country. 3 cases (10%) those took 14 weeks for full weight bearing were – one with Seinsheimer type IV subtrochanteric femoral fracture and two cases with poor hip pin screw fixation. The average stay in the hospital was 12 days. Varus reduction occurred with use of a short lag screw. Shattering of the greater trochanter occurred due to over hammering of the nail.

The overall results being satisfactory, our experience in the current study indicates PFN to be a safe and successful method. Varus collapse, difficulty in placement of neck/hip pin screws and intra articular migration of neck /hip pin screw might be the complications in very few cases which can be minimized by minimizing the technical errors while screw insertion.

Proximal Femoral Nail (PFN) combines the intrinsic advantages of the closed intramedullary nail (less operative time, less exposure, less disturbance to the fracture milieu) and those of Dynamic Hip Screw (collapse of the fracture fragments to augment stability and healing). Distinct practical advantages of PFN are less of limb length discrepancies and the need to restitute the medial buttress has been made obsolete. The healing time is faster and the delayed and non unions are rare. The additional antirotational hip pin screw prevents rotation and reduces the incidence of implant cut out while the fluting of the nail tip (i.e. the tip has smaller diameter) reduces the stress at the tip and hence reduces the energy fractures at the tip.

REFERENCES